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Accelerator Mass Spectrometry: Nuclear Physics in Support of Other Disciplines*

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Accelerator Mass Spectrometry (AMS) is a technique that uses a tandem electrostatic accelerator to achieve single atom sensitivity for a class of rare isotopes such as ^{3}H, ^{10}Be, ^{14}C, ^{26}Al, ^{76}Cl, ^{41}Ca, and ^{129}I. These isotopes are generated in the atmosphere and top meter of the earth by cosmic ray primaries and secondaries, have half-lives ranging from thousands to millions of years, and are thus useful chronometers and tracers for natural activities that affect humans and their environment. As these isotopes are generated by nuclear power and nuclear weapons as well, they have additional utility for the study of dramatic anthropogenic events. Because of their rarity and relatively near-benign decay modes isotopes such as ^{3}H, ^{14}C, ^{26}Al, and ^{41}Ca are excellent substitutional labels in biomedical and clinical research. By achieving sensitivities for detection of these isotopes a thousand-to-billion-fold greater than possible with scintillation counting methods, AMS has become a "disruptive" technology, forcing reexamination of previous applications and making possible new ones. Approximately forty tandem accelerators world-wide are now utilized part- or full-time in research across many disciplines using this technology. New problems may be solved as additional isotopes are added to the list of those accessed with this measurement technique.

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